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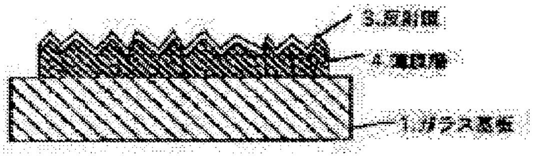
(54) LIGHT DIFFUSING MEMBER, PRODUCTION OF LIGHT DIFFUSING MEMBER, AND TRANSFER FILM

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a light diffusing member having a light diffusing face which improves reflection characteristics such as of a diffusion reflector for a reflection type LCD with a high production efficiency by providing the light diffusing face to which a rugged pattern of a metal plating film surface is transferred.

SOLUTION: In this method to form a diffusion face such as a diffusion reflector for a reflection type LCD, a thin film layer 4 is formed on the substrate 1 where a rugged pattern is to be formed, and a metal plating film surface is pressed to the thin film layer 4. Thus, a light diffusing face having many fine recesses and projections can be formed in a simple process at a low cost compared to a method of patterning using a photomask. Further, by forming a reflection film 3 such as a metal thin film on the diffusion face, a desired diffusion reflector can be obtd. Or, instead of he reflection film 3, by imparting the difference in the refractive index to the material which forms the light diffusion face, a desired light diffusion plate can be obtd. Thus, a light diffusing member such as a diffusion reflector having good reflection characteristics can be efficiently produced.



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CLAIMS

[Claim(s)]
[Claim 1]An optical diffusion member provided with a light diffusing surface of a field which transferred uneven shape of a metal plating membrane surface.
[Claim 2]An optical diffusion member provided with a light diffusing surface of a field which transferred a field which transferred uneven shape of a metal plating membrane surface.
[Claim 3]The optical diffusion member according to claim 1 or 2 in which a reflecting film was formed to a light diffusing surface.
[Claim 4]An optical diffusion member given [Claims 1-3 each] in a clause from which a ratio (R/R0) of reflected light intensity (R) of a light diffusing surface when a reflecting film is formed, and reflected light intensity (R0) of the perfect diffuse surface becomes less than one in a field of 60 diffusion directions or more, and becomes one or more in 15 diffusion directions.
[Claim 5]An optical diffusion member given [Claims 1-4 each] in a clause given uneven shape of a metal plating membrane surface is an average pitch of 0.7-150 micrometers.
[Claim 6]A manufacturing method of an optical diffusion member given [provided with a process of transferring uneven shape of a metal plating membrane surface with which the roll core surface, a belt surface, or the roll surface is covered in part at least / Claims 1-5 each] in a clause.
[Claim 7]A manufacturing method of the optical diffusion member according to claim 6 whose metal plating film is a cascade screen of coppering or coppering, and other metal thin films.
[Claim 8]a metal plating film -- after a coppering process, (1) copper etching step, and (2) -- a manufacturing method of the optical diffusion member of a laminating process of a chemically stable thin film according to claim 7 provided with one of processes at least.
[Claim 9]A manufacturing method of the optical diffusion member according to claim 8 whose stable thin film is a lamination plating film of nickel, chromium, or nickel and chromium chemically.
[Claim 10]A transferring film in which a field which a thin film layer is laminated by temporary support in which the light diffusing surface according to claim 1 to 5 was formed, and is not laminated by said temporary support of said thin film layer constitutes an adhesion side to a transferred board.
[Claim 11]A diffuse reflection plate for reflective liquid crystal display with which a light diffusing surface given [Claims 1-5 each] in a clause was formed.
[Claim 12]An anti glare film in which a light diffusing surface given [Claims 1-5 each] in a clause was formed.
[Claim 13]An optical diffusion board for solar cells with which a light diffusing surface given [Claims 1-5 each] in a clause was formed.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the transferring film used for the manufacturing method of an optical diffusion member and an optical diffusion member used for the solar cell etc. for which the anti glare film which arranges in the high-reflective-liquid-crystal display device and the front face of a display device which do not need a back light, and prevents a move lump, and a well head are needed, and manufacture of an optical diffusion member.
[0002]
[Description of the Prior Art]The liquid crystal display (it abbreviates to LCD below) is used for displays, such as a clock, a calculator, TV, and a personal computer, now taking advantage of the features, such as a thin shape, small size, and low power consumption. Color LCD is developed, it is beginning to be used for many uses, such as a navigation system, a view finder, and an object for the monitor of a personal computer, centering on OA and AV equipment, and it is expected in recent years that the commercial scene will be expanded rapidly from now on. Especially reflection type LCD that displays from the outside by reflecting the light which entered attracts attention as a portable terminal dexterous way at the point which has little power consumption since the back light is unnecessary and in which a thin shape and a weight saving are possible.
[0003]Although the TSUISUTEDDO pneumatic system and the sault PATSUI Stead pneumatic system are adopted as reflection type LCD from the former, by these systems, one half of incident light will not be used for a display by the linear polarization child, and a display will become dark. Then, light polarizer is reduced to one sheet and the display mode of the system combined with the phase difference plate or a phase transition type guest host system is proposed. drawing 2 is what the sectional view of reflection type LCD is shown for -- 1 -- a glass substrate and 2 -- a thin film layer and 3 -- a reflecting film and 11 -- a light filter and 12 -- a black matrix and 13 -- as for a liquid crystal layer and 17, a flattening film and 15 are [a phase difference film and 19] polarizing plates a spacer and 18 an orienting film and 16 a transparent electrode and 14.
[0004]In order to obtain a bright display in reflection type LCD, using outdoor daylight efficiently, it is necessary to make the luminous intensity scattered about in the direction vertical to a display screen increase to the incident light from all angles further. Therefore, it is required to control the reflecting film on a light reflector so that a suitable reflection property is obtained. The method (JP,H4-243226,A) of applying a photopolymer to a substrate, patternizing using a photo mask, forming unevenness, forming a metal thin film, and forming a diffuse reflection plate is proposed.
[0005]
[Problem to be solved by the invention]By the aforementioned method, since there was a process which is exposed with a photo mask and developed for every substrate in order to form unevenness, a process is complicated and it was not able to be said to be low cost and a high throughput. It is difficult to produce stably the diffuse reflection plate which has a fixed reflection property that uneven shape changes with processes, such as development and postbake, easily in a photo mask. By the aforementioned method, since spreading of the photopolymer of multiple times, exposure, and development are required, a process becomes more complicated to obtain a diffuse reflection plate with two or more concavo-convex height in order to raise a reflection property furthermore. Manufacturing efficiency of this invention is high and an optical diffusion member with the light diffusing surface which makes good the light diffusing characteristic of the diffuse reflection plate for reflection type LCD, etc., and the transferring film used for the manufacture are provided.
[0006]
[Means for solving problem]The optical diffusion member of this invention is provided with the light diffusing surface of the field which transferred the uneven shape of the metal plating membrane

surface. The optical diffusion member of this invention is provided with the light diffusing surface of the field which transferred the field which transferred the uneven shape of the metal plating membrane surface. A reflecting film can be formed in a light diffusing surface. The ratio (R/R0) of the reflected light intensity (R) of a light diffusing surface when a reflecting film is formed, and the reflected light intensity (R0) of the perfect diffuse surface becomes less than one in the field of 60 diffusion directions or more, and one or more is the optical diffusion member of this invention in 15 diffusion directions. As for the uneven shape of a metal plating membrane surface, it is preferred that it is an average pitch of 0.7-150 micrometers. The manufacturing method of the optical diffusion member of this invention is provided with the process of transferring the uneven shape of the metal plating membrane surface with which the roll core surface, a belt surface, or the roll surface is covered in part at least. a metal plating film is a cascade screen of coppering or coppering, and other metal thin films -- after a coppering process, (1) copper etching step, and (2) -- the thing of the laminating process of a stable thin film for which it has one of processes at least is chemically preferred. A stable thin film has a chemically preferred lamination plating film of nickel, chromium, or nickel and chromium. The field which laminates a thin film layer to the temporary support in which the aforementioned light diffusing surface was formed, and is not laminated by the temporary support of the thin film layer at it can consider it as the transferring film which constitutes the adhesion side to a transferred board. By this invention, the diffuse reflection plate for reflective liquid crystal display with which the aforementioned light diffusing surface was formed, an anti glare film, and the optical diffusion board for solar cells are provided. .

[0007]

[Mode for carrying out the invention]According to the formation method of a light diffusing surface of a diffuse reflection plate for reflection type LCD of this invention, etc. A light diffusing surface where a process is simple and has many detailed unevenness on the surface by low cost rather than a method of patterning with a photo mask can be formed by forming a thin film layer in a concavo-convex formation schedule side of a substrate, and pressing a metal plating membrane surface to the thin film layer. If reflecting films, such as a metal thin film, are further formed in this, a desired diffuse reflection plate will be obtained. If refractive index difference is made to have between media which form a light diffusing surface instead of a reflecting film, a desired optical diffusion board will be obtained.

[0008]A process of laminating a thin film layer on a metal plating film, and a process of transferring said thin film layer to a concavo-convex formation schedule side of said substrate are simpler than a method of patterning with a photo mask, and can form a thin film layer which has many detailed unevenness on the surface in low cost. If reflecting films, such as a metal thin film, are further formed in this, a desired diffuse reflection plate will be obtained. If refractive index difference is made to have between media which form a light diffusing surface instead of a reflecting film, a desired optical diffusion board will be obtained.

[0009]A base film which changed processing treatment into the state of having many detailed unevenness on the surface by pressing a metal plating film, Using a transferring film in which a thin film layer and a cover film were laminated one by one, laminate a cover film so that a thin film layer may touch a substrate with peel-off, and a thin film layer and a base film are laminated on a substrate, A thin film layer which has many detailed unevenness on the surface can be formed on a substrate by exfoliating said base film. If reflecting films, such as a metal thin film, are further formed in this, a desired diffuse reflection plate will be obtained. If refractive index difference is made to have between media which form a light diffusing surface instead of a reflecting film, a desired optical diffusion board will be obtained. A transferring film which laminated a reflecting film is beforehand used between a thin film layer and a base film, If a cover film is laminated so that a thin film layer may touch a substrate with peel-off, a thin film layer, a reflecting film, and a base film are laminated on a substrate and only said base film is exfoliated, a desired diffuse reflection plate will be obtained.

[0010]A deformable under coat may be provided in a base film, and what was formed by the process of pressing a metal plating film against this layer, and the process of hardening an under coat may be used for it instead of a base film. Since a metal plating film is used in order to use the uneven shape of the surface, it becomes usable [multiple times] by transfer. Thereby, a light diffusing surface can be manufactured more inexpensive than the case where the metal plating film itself is used. It is hard to perform metal plating by transfer, for example, a light diffusing surface can be efficiently manufactured to the base material surface of a glass surface etc.

[0011]That by which many detailed unevenness was formed in the surface of base materials, such as a part of a sheet shaped, belt shape, rolled form, shape of a roll, or curved surface, at the whole surface or a required portion can be used for a metal plating film, may be stuck on a pressurizer, or may be put and used for it between the field and pressurizer which form unevenness. Heat, light, etc. may be given at the process to press. Seamless-izing is easily possible also for a light diffusing surface by forming seamlessly belt shape, rolled form, and a roll-like metal plating film. It is necessary to design the grade of unevenness of a metal plating membrane surface in consideration of usually changing by hardening a thin film layer. When the reduction of area by hardening of a thin film layer is set to a, the difference of the height of a crevice and heights 0.1 micrometer - 15 micrometers as form after hardening of a thin film layer further, the pitch of 0.1 micrometer - 5 micrometers, and heights — either of 0.7-micrometer or more 150 micrometers or picture element pitches — it is [below smaller one] preferred that it is below the smaller one either of not less than 2 more micrometer 150 micrometers or a picture element pitch.

[0012]The sectional view of the diffuse reflection plate with which drawing 1 was provided with the light diffusing surface of this invention, the sectional view of the metal plating film in which drawing 3 is used for formation of the light diffusing surface of this invention, It is a sectional view of the metal plating film which is used for formation of the light diffusing surface of this invention as for drawing 4, and a sectional view of the metal plating film which is used for formation of the light diffusing surface of this invention as for drawing 5, and, as for a reflecting film and 4, a glass substrate and 2 are [a stable thin film and 6] core materials chemically a thin film layer and 5 a coppering film and 3 1.

[0013]The measuring device of the reflection property of the diffuse reflection plate of this invention is shown in drawing 8. If the angle which the reflected ray 21 and the incident light 22 make is set to theta, and it enlarges, the luminosity, i.e., the reflectivity, which are observed in the range of theta needed in the normal line direction of a diffuse reflection plate, the diffuse reflection plate which is excellent in a reflection property will be obtained. When the range of theta needed is -60 degree-60 degree, the diffuse reflection plate with which unevenness is formed in the concave curve as shown in drawing 9, If the relation of height H of a crevice and heights and the pitch P of heights is near the straight line shown with the expression of relations of P=7xH as shown in drawing 10, the diffuse reflection plate which is excellent in a reflection property will be obtained. When theta is -15 degrees - 15 degrees, if it is near the straight line shown with the expression of relations of P=30xH, the diffuse reflection plate which is excellent in a reflection property will be obtained. This shows that what is necessary is to just be made to the form which compounded the field near [which are shown with the expression of relations of P=7xH, and the expression of relations of P=30xH / two] a straight line, when making diffuse reflection profitably like with the light source of the range of 60 degrees to a normal and supposing profitably [it is stronger and] like in 15 more degrees. Of course, it limits that no unevenness is included in the range near [above-mentioned / two] a straight line. It is because the form of uneven shape production process top plurality is naturally formed. The gap uniformity of a liquid crystal layer and the influence of interference of light must be taken into consideration.

[0014]Therefore, a grade of unevenness of a metal plating membrane surface, A difference of height of a crevice and heights in a convex surface to 0.1xamum - 15xamum, and a pan. a pitch of 0.1xamum - 5xamum, and heights — either of 0.7-micrometer or more 150 micrometers or picture element pitches — it is [below smaller one] preferred that it is below the smaller one either of not less than 2 more micrometer 150 micrometers or a picture element pitch. A value of a may change with construction material of a thin film layer, for example, it may be 2 or it may be 1 or 0.7. Although the above is an example at the time of forming unevenness of a diffuse reflection plate in a concave curve as shown in drawing 9, When unevenness of a diffuse reflection plate is formed on a curved surface compound [concavo-convex] as shown in drawing 11, diffuse reflection from a light source of less than 60 degrees is excellent in a reflection property to a normal, if a relation of height H of a crevice and heights as shown in drawing 12, and the pitch P of heights is near the straight line shown with an expression of relations of P=3.5xH. Uneven shape does not need to be periodically located in a line in a field, and may be irregular. Since moire will occur if different periodicity from a picture element pitch is in uneven shape in the case of LCD, concavo-convex periodicity is the same as a picture element pitch, or it is preferred that unevenness is located in a line in a cycle which breaks integrally, or irregular arrangement. Since uneven shape of a metal plating membrane surface is located in a line in irregular arrangement, unless periodicity is given intentionally, it is used for LCD and moire does not generate it.

[0015]Although concavo-convex face shape in particular is not limited, it is preferred that not only a compound flat surface but they are a concave curve or a convex surface, a curved surface compound [concavo-convex], a concave curve further approximated to a surface of a sphere or a paraboloid or a convex surface, and a curved surface compound [concavo-convex]. It is because the diffused light from a wide range light source position is expectable by considering it as a curved surface.

[0016]The necessity of forming a light diffusing surface in an LCD cell in the case of a diffuse reflection plate for reflection type LCD to especially the average height low difference H is so preferred that it is small in consideration of a cell gap or deltand. However, since it cannot do so small that interference of light produces the pitch P of heights, a minimum of the average height low difference H can be found from an expression of relations of above-mentioned P and H. Below, theta is discussed in an absolute value so that it may be easy to understand. The diffusion direction theta which the refractive index n of an LCD cell changes with the structures, for example, is needed in the case of n= 1.3 is a field of less than 50.3 degrees. A diffusion direction of 50.3 degrees or more causes total internal reflection by an interface of an LCD cell and the atmosphere. Therefore, it is necessary to stop low the reflectivity R of a diffusion direction of 50.3 degrees or more, and to raise the reflectivity R of less than 50.3 degrees. For example, the diffusion direction theta which is needed in the case of n= 1.5 is a field of less than 41.8 degrees. A diffusion direction of 41.8 degrees or more causes total internal reflection by an interface of an LCD cell and the atmosphere. Therefore, it is necessary to stop low the reflectivity R of a diffusion direction of 41.8 degrees or more, and to raise the reflectivity R of less than 41.8 degrees. When people generally see LCD, it sees from a transverse plane of LCD. In this case, there is little light which enters into LCD from a direction with people's eyes, and there is much incident light from a direction which makes an angle of 10 degrees or more from a direction with people's eyes. For example, in the case of n= 1.5, incident light from the atmosphere of 22.8 degrees will be 15 degrees by interface passage of an LCD cell and the atmosphere. Therefore, it is necessary to raise especially the reflectivity R near the direction of theta= 15 degrees of a diffuse reflection plate formed in an LCD cell. For example, in the case of n= 1.3, incident light from the atmosphere of 19.7 degrees will be 15 degrees by interface passage of an LCD cell and the atmosphere. Therefore, it is necessary to raise especially the reflectivity R near the direction of theta= 15 degrees of a diffuse reflection plate formed in an LCD cell. In order to manufacture a light diffusing surface used for a diffuse reflection plate for reflection type LCD, in view of the above reflectivity characteristics, it is necessary to build an expression of relations and to design the average height low difference H and the pitch P.

[0017]As for the metal plating film of this invention, a coppering film, a nickel plating film, a chrome plating film, silver plating films, or these cascade screens are used. Control of unevenness of a metal plating membrane surface is usually controlled by plating conditions, the etching condition or plating conditions, and both the conditions of an etching condition. As for the method of metal plating, an example is shown in document "practical use plating (1) (volume Showa 53(1978) issue, Maki Shoten Publishing, and for Japanese plating associations) for a field engineer." For example, copper is formed by acid coppering on a steel pipe at a thickness of 20 micrometers, and detailed uneven shape is acquired. Plating foil, such as commercial plating copper foil and plating nickel foil, can be purchased from Japanese electrolysis, a daylight grade, Fukuda Metal Foil & Powder, the Koga circuit wheel, Mitsui Mining & Smelting, etc., and arbitrary uneven shape can also be acquired by etching.

[0018]Especially, it is desirable, and the range whose average pitch of uneven shape is 0.7-150 micrometers is controlling an average height low difference by plating film thickness, etching, etc., and a coppering film and the top where it is desirable and the electrolytic copper plating film is inexpensive can control and optimize easily the light diffusion direction distribution by the light diffusing surface after transfer. The method of etching can make easy dilute sulfuric acid, chloride, citrate, ammonium persulfate, sulfuric acid, hydrogen peroxide, etc. using the etching reagent used as the main ingredients. It is possible also by dry etching, such as ion milling and RIE. A stable thin film is chemically needed in order that a coppering film may oxidize easily by atmospheric air. A stable thin film has a metal membrane or metal oxide films, such as a nickel layer and a chromium film, etc. chemically. The formation method of a stable thin film has what is called rust prevention treatment, plating, vacuum deposition, a sputtering, CVD, etc. chemically.

[0019]Although the reflection type LCD display device explained above, the light diffusing surface of this invention can be used for a device with required diffusing an extraneous light line. For example, there is a light diffusing surface of the diffuse reflection plate aiming at the improve efficiency of a solar cell. For example, there is an anti glare treating surface aiming at preventing a reflect lump of a display surface. There is a light diffusing surface of the transferring film used for these manufactures. Drawing 15 is a sectional view of a solar cell, 30 is a semiconductor layer and 31 is a transparent electrode.

[0020]

[Working example]Embodiment 1 drawing 6 explains. On the glass substrate 1, the spin coat of the solution for the following thin film layer formation is carried out, and the thin film layer 4 of 2-

micrometer thickness is formed. The coppering film 2 (Japanese electrolysis company copper metallurgy foil Y158 trade name) using a laminator (roll laminator HLM1500, trade name by a Hitachi Chemical techno plant company) so that the rugged surface of minute shape may touch a thin film layer Next, the substrate temperature of 90 **, It laminated by a part for 0.5-m/in the roll temperature of 80 **, the roll pressure power of 7kg/square centimeter, and speed, and the substrate with which a thin film layer and copper foil were laminated on the glass substrate was obtained. Next, copper foil was exfoliated and the thin film layer of the surface of irregular uneven shape was obtained on the glass substrate. Next, heat curing of 230 ** and 30min was carried out in oven, and with the vacuum deposition method, the aluminum thin film was laminated so that it might become 0.2 micrometer of thickness, and the reflecting layer was formed. The incidence angle degree dependency of the reflectivity (relative intensity to a standard white plate) at the time of seting an angle of direction (phi) constant is shown in drawing 13. It turned out that reflectivity sufficient in incidence angle degree-60 degree-60 degree is obtained, and the diffuse reflection plate excellent in the reflection property can be obtained.
The solution for thin-film-layer formation: Styrene, methyl methacrylate, ethyl acrylate, acrylic acid, and glycidyl methacrylate copolymerization resin were used as polymer (polymer A). About 35000 acid value of a molecular weight is 110. A part is a weight section (it is below the same).
(Polymer) Polymer A 70 copy (monomer). Pentaerythritol tetraacrylate . 30 copies (photoinitiator) IRGACURE 369 (Tiba Specialty Chemicals) 2.2-copy N,N-tetraethyl 4,4'-diaminobenzophenone 2.2 copies (solvent) Propylene glycol monomethyl ether 492 copies (polymerization inhibitor). p-methoxy phenol 0.1 copy (surface-active agent) Perfluoroalkyl alkoxylate 0.01 copy[0021]Embodiment 2 drawing 7 explains. After performing 20 micrometers of copperings to a steel pipe, soft etching was carried out 20 sec with 1wt% of dilute sulfuric acid, rust prevention treatment was carried out with the solution which diluted the KAPAGU ream 125A of Meltex 5 times, and it was considered as the roll original recording of minute shape. Next, a 100-micrometer-thick polyethylene terephthalate film is used for the base film 7, Spreading desiccation was carried out and it was considered as the under coat 9 so that the photosensitive resin composition of the following presentation might be dissolved with a solvent (propylene glycol monoethyl ether acetate) on this base film and it might become 20-micrometer thickness by a comma coating machine. Next, roll original recording was pressed, it irradiated with ultraviolet rays, the photo-setting resin was hardened, roll original recording was separated, and irregular uneven shape was formed in the surface of a photo-setting resin layer (under coat). Next, on the photo-setting resin layer (under coat), spreading desiccation of the solution for the following thin film layer formation was carried out so that it might become 2-micrometer thickness by a comma coating machine, the thin film layer 4 was formed, the polyethylene film was covered as the cover film 8, and the transferring film was obtained.
[0022]A cover film of this transferring film using a laminator (roll laminator HLM1500, trade name by a Hitachi Chemical techno plant company) so that the thin film layer 4 may touch the glass substrate 1 with peel-off Next, substrate temperature of 90 **, It laminated by a part for 0.5-m/in roll temperature of 80 **, roll pressure power of 7kg/square centimeter, and speed, and a substrate with which a thin film layer, a photo-setting resin layer (under coat), and a base film were laminated on a glass substrate was obtained. Next, a photo-setting resin layer (under coat) and a base film were exfoliated, and a thin film layer of the surface of irregular uneven shape was obtained on a glass substrate. Next, heat curing of 230 ** and 30min was carried out in oven, and with a vacuum deposition method, an aluminum thin film was laminated so that it might become 0.2 micrometer of thickness, and a reflecting layer was formed. The incidence angle degree dependency of reflectivity (relative intensity to a standard white plate) at the time of seting an angle of direction (phi) constant is shown in drawing 14. It turned out that reflectivity sufficient in incidence angle degree-60 degree-60 degree is obtained, and a diffuse reflection plate excellent in a reflection property can be obtained.

A photopolymer solution. (% is weight %) : acrylic acid-butyl acrylate vinyl acetate copolymerization resin [ ] -- 33% -- butyl acrylate (monomer) 53% -- a vinyl acetate (monomer) 8% acrylic acid (monomer) 2% HEKICHIN Diol Acre rate (monomer). 1% -- solution for benzoin-isobutyl-ether (photoinitiator) 3% thin film layer formation: -- styrene, methyl methacrylate, ethyl acrylate, acrylic acid, and glycidyl methacrylate copolymerization resin were used as polymer (polymer A). About 35000 acid value of a molecular weight is 110. A part is a weight section (it is below the same).
(Polymer) Polymer A 70 copy (monomer). Pentaerythritol tetraacrylate . 30 copies (photoinitiator) IRGACURE 369 (Tiba Specialty Chemicals) 2.2-copy N,N-tetraethyl 4,4'-diaminobenzophenone 2.2 copies (solvent) Propylene glycol monomethyl ether 492 copies (polymerization inhibitor). p-methoxy phenol 0.1 copy (surface-active agent) Perfluoroalkyl alkoxylate 0.01 copy[0023]

[Effect of the Invention]In optical diffusion members, such as a high-reflective-liquid-crystal display device of this invention. By being able to manufacture efficiently optical diffusion members, such as a diffuse reflection plate which has a good reflection property, and setting up unevenness of minute shape appropriately arbitrarily beforehand, a reflection property can be controlled freely and the good reflection property of reproducibility is obtained.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The sectional view of the diffuse reflection plate using the light diffusing surface of this invention.
[Drawing 2]The sectional view of reflection type LCD.
[Drawing 3]The sectional view of the metal plating film used for formation of the light diffusing surface of this invention.
[Drawing 4]The sectional view of the metal plating film used for formation of the light diffusing surface of this invention.
[Drawing 5]The sectional view of the metal plating film used for formation of the light diffusing surface of this invention.
[Drawing 6]The sectional view of the thin film layer in which the light diffusing surface of Embodiment 1 of this invention was formed.
[Drawing 7]The sectional view showing the manufacturing process of the diffuse reflection plate formed with the transferring film in which the light diffusing surface of Embodiment 2 of this invention was formed, and the transferring film.
[Drawing 8]The perspective view of the equipment which measures the reflected-light characteristic of the light diffusing surface of this invention.
[Drawing 9]The sectional view of the diffuse reflection plate by this invention.
[Drawing 10]The figure showing the relation between the transverse plane of the diffuse reflection plate shown in drawing 9 of this invention, the angle which a light source makes, the difference of the height of an uneven part, and the pitch of heights.
[Drawing 11]The sectional view of the diffuse reflection plate by this invention.
[Drawing 12]The figure showing the relation between the transverse plane of the diffuse reflection plate shown in drawing 11 of this invention, the angle which a light source makes, the difference of the height of an uneven part, and the pitch of heights.
[Drawing 13]The graph which shows the incident angle dependency of the reflection property of the diffuse reflection plate of Embodiment 1 of this invention.
[Drawing 14]The graph which shows the incident angle dependency of the reflection property of the diffuse reflection plate of Embodiment 2 of this invention.
[Drawing 15]The sectional view of a solar cell.
[Explanations of letters or numerals]
1. Glass substrate
2. Coppering film
3. Reflecting film
4. Thin film layer
5. Chemically stable thin film
6. Core material
7. Base film
8. Cover film
9. Under coat
12. Anti glare film
13. Picture element electrode
14. Thin film transistor
15. Orienting film
16. Liquid crystal layer
17. Spacer
18. Phase difference film

19. Polarizing plate
20. Sample
21. Reflected ray
22. Incident light
23. Luminance meter
30. Semiconductor layer
31. Transparent electrode

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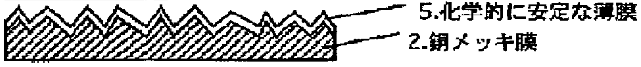
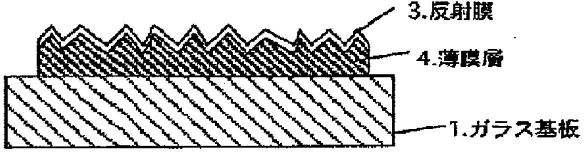
DRAWINGS

[Drawing 4]



[Drawing 1]



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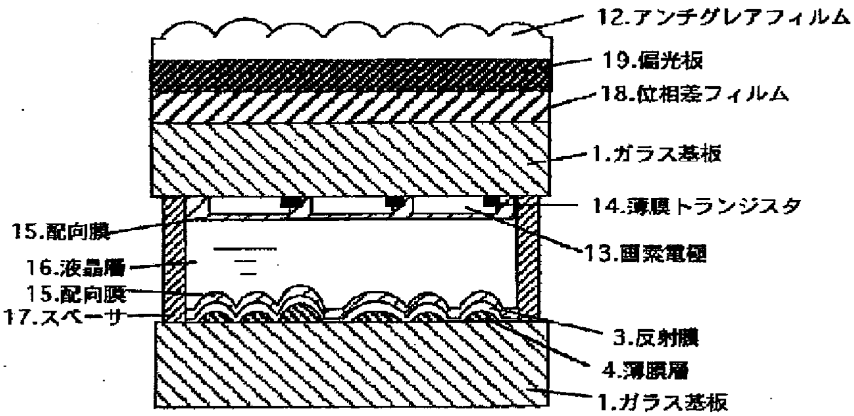

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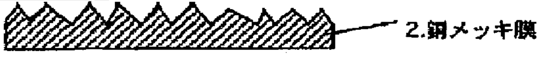

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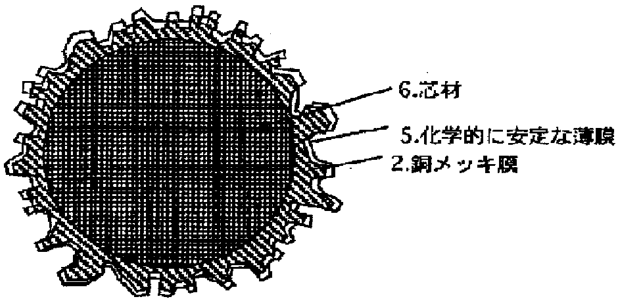

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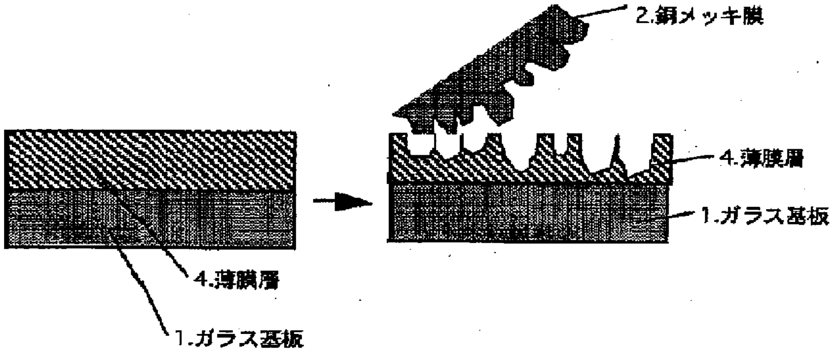

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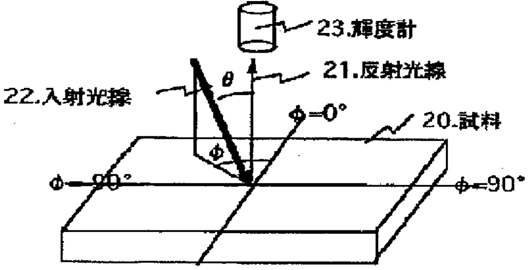
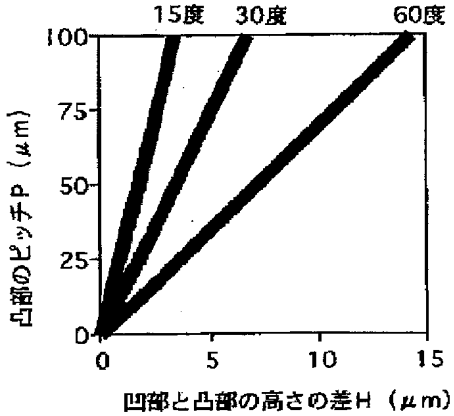


[Drawing 10]



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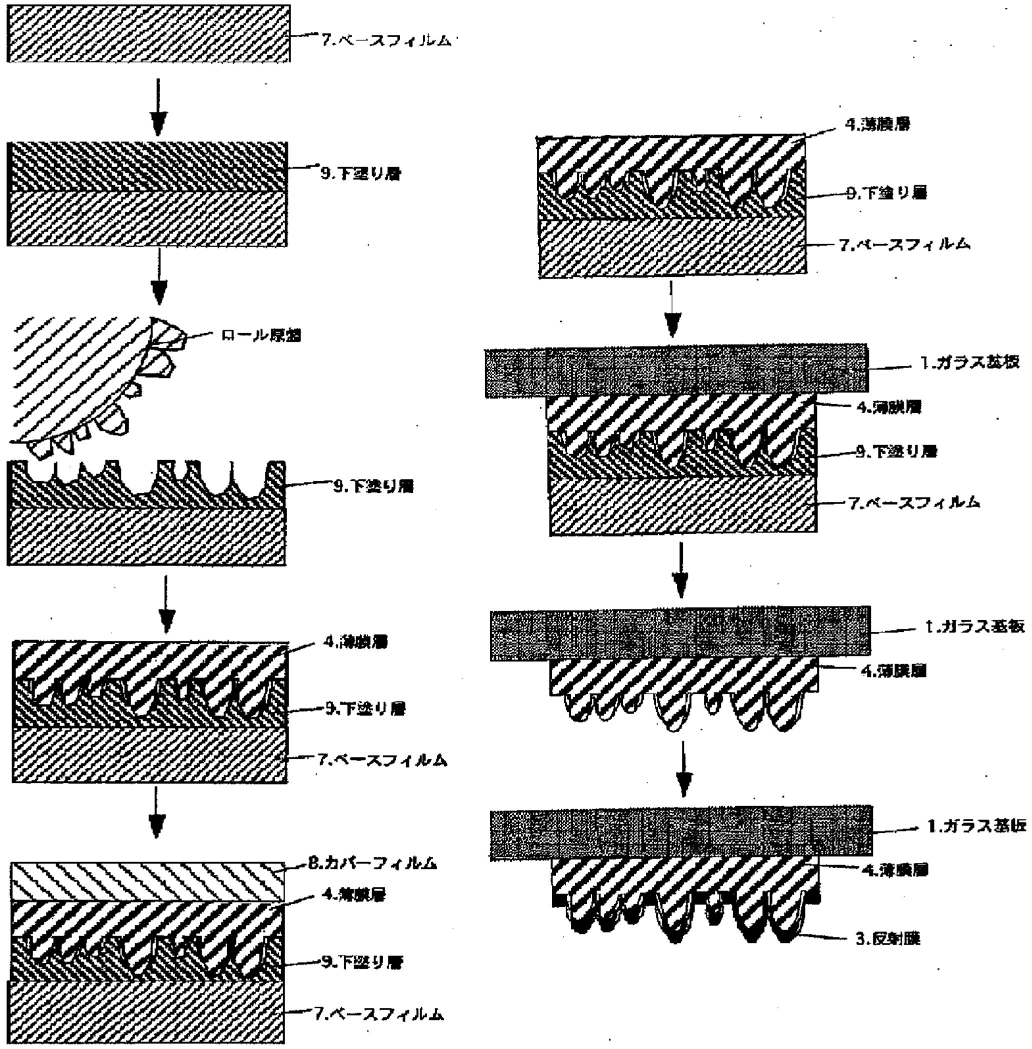
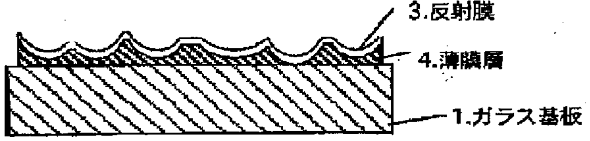
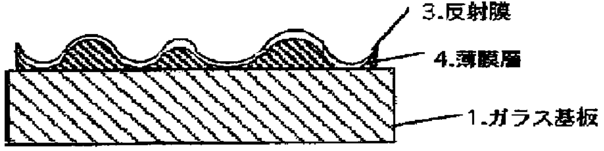


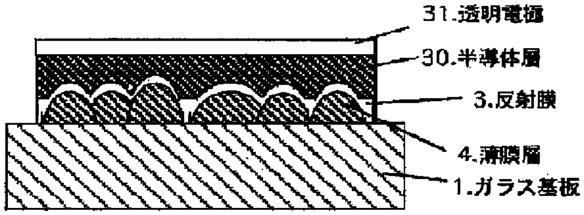
[Drawing 9]



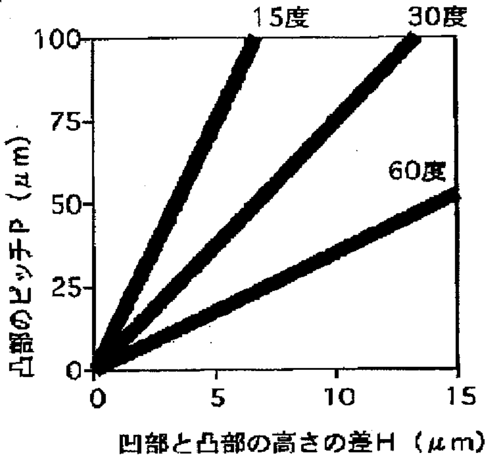
[Drawing 11]



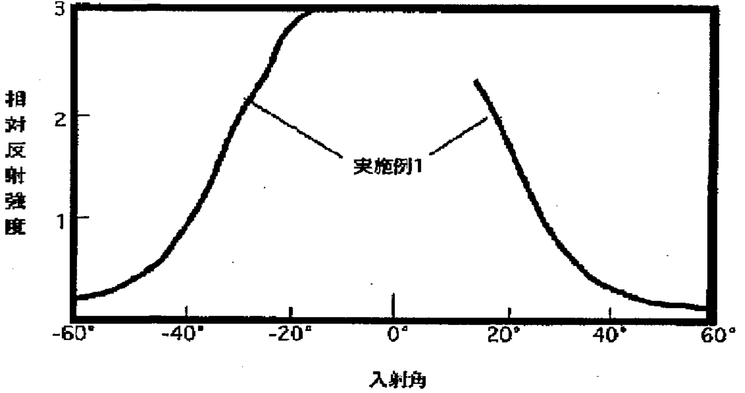
[Drawing 15]



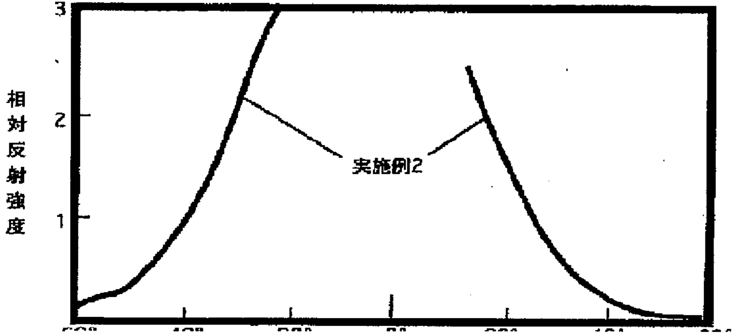
[Drawing 12]



[Drawing 13]



[Drawing 14]



[Translation done.]